UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,822	02/06/2004	Lotfi Hedhli	IR 3699 NP	7965

7590 01/25/2005

Thomas F. Roland, Esq.
ATOFINA Chemicals, Inc.
Patent Department
2000 Market Street, 26th Floor
Philadelphia, PA 19103-3222

EXAMINER	
TUROCY, DAVID P	
ART UNIT	**PAPER NUMBER**
1762	

DATE MAILED: 01/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/773,822	HEDHLI ET AL.	
	Examiner	Art Unit	
	David Turocy	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/6/04, 8/16/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The use of the trademark NAFION and ACIPLEX has been noted in this application. It should be capitalized wherever it appears and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 10 rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a PEM being made of NAFION or ACIPLEX, does not reasonably provide enablement for a PEM made of NAFION and ACIPLEX. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to perform the invention commensurate in scope with these claims. The specification does not enable one of ordinary skill in the art to combine NAFION and ACIPLEX to form a PEM suitable for the process. The examiner is uncertain the methods and proportions used for combining the two membrane types.

For the purposes of applying art the examiner determines the claim to read on a PEM selected from the group consisting of NAFION and ACIPLEX.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 10 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claim 10 contains the trademark/trade name NAFION. Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name. In the present case, the trademark/trade name is used to identify/describe and perfluoroalkylene sulfonic acid polymer, accordingly, the identification/description is indefinite. Appropriate correction is required.

b. Claim 10 contains the trademark/trade name ACIPLEX. Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name. In the present case, the trademark/trade name is used to identify/describe and a sulfonation product of styrene-divinylbenzene copolymer, accordingly, the identification/description is indefinite.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claim 1-5 and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6159533 by Dearnaley et al ("Dearnaley") in view of Schütze et al ("Schütze") and further in view of WO01/32949 by Förnsel et al ("Förnsel").

*** Please note US Patent 6800336 is used as a literal translation of WO 01/32949***

Claims 1, 3-5, and 11-13: Dearnaley discloses a method for depositing a catalyst on a fuel cell electrode for use in a membrane electrode assembly under a vacuum (abstract). Dearnaley discloses using a fuel cell electrode comprising a carbon cloth and membranes including carbon particles (Column 2, lines 29-39). Dearnaley discloses known polymer electrolyte membranes utilized in fuel cells including NAFION (Column 3, lines 30-34). Dearnaley discloses the preferred catalysts is platinum (Column 2, line 56). Dearnaley fails to disclose spraying at atmospheric pressure.

However, Schütze, teaching of an atmospheric plasma jet, discloses operating plasma in a vacuum is expensive and requires maintenance (Page 1685, Column 2, lines 1-7). Schütze also discloses that operating atmospheric pressure plasmas

overcome such disadvantages encountered in the vacuum deposition (Column 1, Paragraph 1). Schütze also discloses that the atmospheric-pressure plasma jet most resembles the low-pressure glow discharge and therefore is being used in a number of material applications that are limited by vacuum (Page 1692, Column 1, Last paragraph). Schütze discloses known and suitable methods for producing an electrical discharge include parallel electrode plates and coaxially arranged electrodes (Page 1690 Paragraph bridging column 1 and 2, Page 1689 Column 1 Last Paragraph).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley to use the atmospheric pressure plasma jet suggested by Schütze to provide a desirable catalyst coating on a fuel cell electrode because Dearnaley teaches plasma spraying in a vacuum and Schütze teaches an atmospheric plasma jet provides an alternative to the expensive vacuum method.

While Dearnaley in view of Schütze discloses an atmospheric plasma jet consists of sending the carrier gas through an electrical discharge, they fail to disclose passing the reactants and the carrier gas through the electrical discharge (Page 1689, Column 2, last paragraph).

However, Förnsel, teaching a known method of plasma coating surfaces at atmospheric pressure, discloses passing reactants and the carrier gas through an electrical discharge at atmospheric pressure (abstract, column 4, lines 38-40). Förnsel discloses passing the reactants though a nozzle containing coaxially arranged electrodes (Column 3, lines 1-2). Förnsel discloses that for coating large surfaces,

attach one or more nozzles eccentrically over a rotating nozzle that scans the nozzles over the membrane (Column 3, lines 6-10).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Schütze to use the atmospheric pressure plasma jet as suggested by Förnsel to provide a desirable catalyst coating on a fuel cell electrode because Dearnaley in view of Schütze teach of plasma spraying at atmospheric pressure and Förnsel teaches of a known atmospheric pressure plasma jet for coating surfaces that passes the reactants and a carrier gas through an electrical discharge.

Claim 2: Dearnaley in view of Schütze and Förnsel fails to explicitly state using a carrier gas without adding a noble gas. While Schütze discloses plasma jets have been developed using helium and a special electrode design to prevent arcing, they also disclose the use of a carrier gases, including nitrogen, depend on the electrode spacing and the pressure (Page 1685 Column 2 – Page 1686 Column 1, Figure 1). In addition, Förnsel discloses using an inert gas as the carrier gas and discloses nitrogen as the carrier gas to prevent oxidation of the reactants of the precursor material (Column 5, lines 11-13).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to select any inert carrier gas, including nitrogen, because Schütze discloses selecting a carrier gas depends on multiple factors and Förnsel teaches of using nitrogen as the carrier gas to prevent oxidation of the reactants.

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6159533 by Dearnaley et al ("Dearnaley") in view of Schütze et al ("Schütze") and WO01/32949 by Förnsel et al ("Förnsel") further in view of US patent 6074692 by Hulett ("Hulett").

Dearnaley in view of Schütze and Förnsel teach all the limitations of these claims as disclosed in the 35 USC 103(a) rejection above and Dearnaley discloses using plasma spray techniques such as chemical vapor deposition allow for deposition of materials over large areas through a reel-to-reel or web coating process, but they fail to explicitly teach of advancing the membrane beneath the nozzle (Column 2, Lines 12-19).

However, Hulett, teaching a method of making a PEM fuel cell, discloses applying a catalyst onto both faces of the strip by spraying as it passes underneath the nozzles (Column 5, lines 17-25, Figure 1).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Schütze and Förnsel to use the traversing membrane suggested by Hulett to provide a desirable PEM fuel cell because Dearnaley in view of Schütze and Förnsel teaches thermal spraying techniques provide for web coating processes and Hulett teaches a PEM web coating process includes advancing the membrane beneath the nozzle.

6. Claims 7 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6159533 by Dearnaley et al ("Dearnaley") in view of Schütze et al ("Schütze") and WO01/32949 by Förnsel et al ("Förnsel") further in view of US Patent Publication 2003/0096154 by Yasumoto et al ("Yasumoto").

Dearnaley in view of Schütze and Förnsel teach all the limitations of these claims as disclosed in the 35 USC 103(a) rejection above, but they fail to teach spraying the catalyst on the surface of the polymer electrolyte membrane.

However, Yasumoto, teaching of a method for spraying a catalyst with a carrier gas, teaches of spraying the catalyst directly onto the surface of the polymer electrolyte film or onto a porous conductive electrode substrate (Paragraph 0014). Yasumoto also discloses by spraying directly onto the film, the catalysts particles become embedded in the film and therefore the cell performance is improved (Paragraph 0016).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Schütze and Förnsel to apply the catalyst directly onto the surface of the polymer electrolyte membrane as suggested by Yasumoto to provide a desirable catalyst layer on a electrolyte membrane because Dearnaley in view of Schütze and Förnsel teaches spraying a catalyst on a porous electrode film and Yasumoto teaches that spraying the catalyst directly onto the polymer electrolyte membrane increase the cells performance over a catalyst sprayed on a porous electrode film.

7. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6159533 by Dearnaley et al ("Dearnaley") in view of Schütze et al ("Schütze") and WO01/32949 by Förnsel et al ("Förnsel") and US Patent Publication 2003/0096154 by Yasumoto et al ("Yasumoto") further in view of US Patent Publication 2004/0180250 by Nanaumi et al ("Nanaumi").

Dearnaley in view of Schütze, Förnsel and Yasumoto teach all the limitations of these claims as disclosed in the 35 USC 103(a) rejection above, but they fail to teach spraying the catalyst on the surface of the polymer electrolyte membrane comprising a acrylic based polyelectrolyte/fluoropolymer blend or a polyhydrocarbon-based sulfonic acid.

However, Nanaumi, polymer electrolyte membrane structures that provide inexpensive electrode structure and have excellent power generation efficiency, discloses using a hydrocarbon-based sulfonic acid (Paragraph 0007, 0010). Nanaumi teaches that such electrolyte polymer membranes comprise copolymers of an acrylic based polymer and a fluoropolymer (Paragraph 0012-0015).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Schütze, Förnsel and Yasumoto to use the polymer electrolyte membrane structure suggested by Nanaumi to provide a desirable catalyst on a membrane because Dearnaley in view of Schütze, Förnsel and Yasumoto teaches spraying catalyst onto a polymer electrolyte membrane and Nanaumi teaches

of known polymer electrolyte membrane structures that are inexpensive and have excellent power efficiency.

8. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6159533 by Dearnaley et al ("Dearnaley") in view of Schütze et al ("Schütze") and WO01/32949 by Förnsel et al ("Förnsel") and further in view of US Patent Publication 2003/0059659 by Kamo et al ("Kamo").

Claims 14 and 15: Dearnaley in view of Schütze and Förnsel teach all the limitations of these claims as disclosed in the 35 USC 103(a) rejection above, but they fail to teach of a catalyst layer including a platinum alloy or a binary and ternary platinum alloy using metals from column 4-11 of the periodic table.

However, Kamo, teaching of fuel cell equipment using an electrolyte membrane, discloses while the cathode catalysts is known to be fine platinum particles, the anode side comprise fine particles of platinum and ruthenium or platinum/ruthenium alloys (paragraph 0066). In addition Kamo discloses it is advantageous to combine the noble metal components with a third component selected from iron, tin, rare earth elements, etc. to stabilize and extend the life of the electrode (Paragraph 0067).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Schütze and Förnsel to use the platinum/ruthenium alloy as suggested by Kamo to provide a desirable catalyst layer on a electrolyte membrane because Dearnaley in view of Schütze and Förnsel teaches an

polymer electrolyte membrane with a platinum catalyst layer and Kamo teaches that platinum/ruthenium alloy is a known substitute for platinum and ruthenium particles for an anode catalyst and additional elements increase the catalyst stability and life span.

9. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6159533 by Dearnaley et al ("Dearnaley") in view of Schütze et al ("Schütze") and WO01/32949 by Förnsel et al ("Förnsel") and further in view of Haug et al ("Haug").

Dearnaley in view of Schütze and Förnsel teach all the limitations of these claims as disclosed in the 35 USC 103(a) rejection above, but they fail to teach of depositing multiple catalyst layers.

However, Haug, teaching of increasing the PEM catalyst effectiveness, discloses using a multilayer electrode technique increases the regions of active platinum by increasing the number of platinum layers deposited (Pg A284, Column 2 last paragraph). In addition, Haug discloses that Membrane electrode assemblies with multiple layers of platinum outperform those with only a single layer (Page A285, Column 1, First Paragraph).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Dearnaley in view of Schütze and Förnsel to use the multiple platinum layers as suggested by Haug to provide a desirable catalyst layer on a electrolyte membrane because Dearnaley in view of Schütze and Förnsel teaches an polymer electrolyte membrane with a platinum catalyst layer and Kamo teaches that

multiple platinum layers increases the region of active platinum over a single platinum layer.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Turocy whose telephone number is (571) 272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

David Turocy
AU 1762

SHRIVE P. BECK
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700